Phy 104a, HW1

Introduction to Mathematical Physics Phy 104a

- Homework Assignment I -

Due by: Wednesday Oct 12, by 5 PM at the drop-off box.

**Problem 1.** Page 86, Chapter 3, Section 2, Problem 6: Solve the following set of equations by reducing the matrix to row echelon form:

\[
\begin{align*}
2s + r &= 1 \\
s - p &= 6 \\
3 - q + 2r &= 0 \\
r - 2s + 3q &= 0
\end{align*}
\]

**Problem 2.** Page 86, Chapter 3, Section 2, Problem 7: Solve the following set of equations by reducing the matrix to row echelon form:

\[
\begin{align*}
x - 2y &= 4 \\
5x + z &= 7 \\
x + 2y - z &= 3
\end{align*}
\]

**Problem 3.** Page 93, Chapter 3, Section 3, Problem 3: Evaluate the determinant by reducing it as shown in Example 4 and using the Laplace development:

\[
\begin{vmatrix}
1 & 1 & 1 & 1 \\
1 & 2 & 3 & 4 \\
1 & 3 & 6 & 10 \\
1 & 4 & 10 & 20
\end{vmatrix}
\]  \hspace{1cm} (1)

**Problem 4.** Page 94, Chapter 3, Section 3, Problem 13: Show that:

\[
\begin{vmatrix}
\cos \theta & 1 & 0 \\
1 & 2 \cos \theta & 1 \\
0 & 1 & 2 \cos \theta
\end{vmatrix} = \cos 3\theta \hspace{1cm} (2)
\]
Problem 5. Page 104, Chapter 3, Section 4, Problem 10: If $\vec{A} + \vec{B} = 4\vec{j} - \vec{i}$ and $\vec{A} - \vec{B} = \vec{i} + 3\vec{j}$ find $\vec{A}$ and $\vec{B}$ algebraically. Show by a diagram how to find $\vec{A}$ and $\vec{B}$ geometrically.

Problem 6. Page 104, Chapter 3, Section 4, Problem 13: If $\vec{A} = 4\vec{i} - 3\vec{k}$ and $\vec{B} = -2\vec{i} + 2\vec{j} - \vec{k}$ find the scalar projection of $\vec{A}$ on $\vec{B}$, the scalar projection of $\vec{B}$ on $\vec{A}$, and the cosine of the angle between $\vec{A}$ and $\vec{B}$. 